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AUTHOR Gavigan, Patrick; Hesemann, John
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ABSTRACT

This report is part of an overview of the aspirations, methods, and summary results of associational analyses of Indiana assessment data. The study was based on the recognition of policy makers' needs to understand the causes of existing conditions in their schools and to be able to evaluate compound implications of their actions. A survey data base was used and an effort was made to select variables which corresponded directly to present policy questions and which could be supported by a review of recent literature. Scaling was kept to a minimum and no a priori assumptions were formulated about what analyses might signify. The first section examines the background, purposes, methods, procedures, and major results obtained by a reanalysis of the 1973 assessment data. The major objectives of this study were to determine which aspects of the instructional process are most effective in increasing reading performance, and which of those important characteristics which govern reading ability could be altered within the context of the educational community. The second section is a summary of preliminary investigations. The third section is a summary of results with the student as the unit of analysis. The fourth section is a summary of results with the school as the unit of analysis. The two attachments include variable definitions and selected references. (TS)

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INDIANA EDUCATIONAL NEEDS ASSESSMENT PROJECT: AN INTRODUCTION TO THE ANALYSIS OF CORRELATES OF READING SKILLS IN INDIANA PUBLIC SCHOOLS

Patrick Gavigan

John Hesemann

Division of Innovative and Exemplary Education

Indiana State Department of Public Instruction

Harold H. Negley, Superintendent

November, 1975

CS002442

The data presented herein was gathered pursuant to Public Law 89-10. However, the summaries expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education or the Indiana Department of Public Instruction.

PREFACE

This report is an overview of the aspirations, methods, and summary results of associational analyses of Indiana assessment data. It is the first of two volumes to be produced, and will contain only summaries of major questions brought forth by this investigation. The complete narrative is more technical in nature, and rather than run the risk of not communicating with our primary audiences at all, we have chosen to publicize introductory thoughts under a separate cover.

Our concern for the practical consumers of this investigation illustrates a dilemma confronting educational researchers. How does one demonstrate genuine pedagogical concern, fundamental to the effectiveness of any policy research, and still meet the specifications of inferential statistical models? For example, when variables are scaled and/or combined to define indices, or to fit distribution assumptions, they may lose the direct interpretation necessary for policy decision-making. Also, when relationships are uncovered in survey data, the researcher is open to the charge of "data-snooping" for relationships which may be peculiar to the sample surveyed.

This study was conducted because we recognize policy makers' needs: 1) to understand multiple "cause" of existing conditions in their schools, and 2) to be able to evaluate compound implications of their actions. On the other hand, we want to stress the critical need for more discussion within the research community of how higher-level analysis models might be more effectively applied toward policy-making, given the limitations of a data base derived primarily through non-experimental methods.

Since any discussion of the paucity of theory is easily misinterpreted by researchers, the point must be made at the outset that our position is that it is desirable and possible to formulate educational policies which are empirically informed and logically warranted. In pursuit of this notion we chose to work from a survey data base only, since it is doubtful that any other means of systematic data collection on a large scale will be feasible in the immediate future. An effort was made to select variables which correspond directly to present policy questions, and also which could be supported by a review of recent literature. Scaling was kept to a minimum. This was done so that variables would maintain a degree of face value and would correspond to those used to report this data base in descriptive fashion. Finally, we did not formulate any a priori assumptions about what these analyses might signify other than a belief they might provide greater insight into our earlier findings. We tested no hypotheses, explicit or otherwise.

For those readers whose interests lie in the field of reading, our concern about an inadequate theory to explain these analyses resulted in the reading process being treated more as a vehicle for analysis than as the subject under investigation. Although we offer

findings which appear salient to the reading specialist, we treat them as impressions only. No attempt at thorough documentation of related pedagogical issues has been made for present purposes. Instead, we sought to highlight findings at this time as they compare with other well-known investigations of a similar methodological persuasion.

By tackling the broader issue of overall school effectiveness, we accept some inherent criticisms. For instance, possible arguments stemming from issues such as the criteria for selection and scaling of variables, or the value of "R2" for drawing policy implications in the first place, are duly noted. On the other hand, these possible concerns did not outweigh our need to take a predetermined path for comparative purposes. Investigations which employed similar statistical techniques have forced broader social issues to impact heavily upon school policy, while key issues revolving around quality instruction continue to be resolved upon "show and tell" documentation or left entirely to intuitive judgments.

While there are hurdles to overcome, there is value in pursuing causal inference models based on assessment/evaluation-type data. For example, no one can argue that studies which take a macroview of educational interventions producing descriptive statements about "current status of affairs" best serve the information needs of the community at large. But is this the case with teachers? It would appear that school official-teacher dialogue could benefit by studies which demonstrate administrators' concern for underlying factors associated with improved instructional programs. In any case, such an exercise would be of benefit to the researcher, in his recognition of the need to strike a more reasoned balance between the indepth richness provided by small samples and the ability for generalization provided by large ones.

For those researchers who might wish to employ association analysis techniques as a portion of future analysis plans, we recommend the analysis be focused on these questions:

1) To what degree do specific school programs, instructional practices, etc., influence school outcomes?

2) In what ways?

3) Who might benefit most by altering school programs or practices?

The analytical model we found most useful in pursuing these questions partitions the amount of variation among student scores accounted for by each of the following components in step-wise fashion:

a) Individual student background factors:

b) Background factors, and other student characteristics such as attitude;

c) Background factors: other characteristics, and community-related school factors such as location, income levels, physical plant, etc.;

d) Background factors; other characteristics; community variables, and instructional program characteristics.

We suggest that the student is the logical unit of analysis. A partition of variance separated for white, black and other races is recommended as well. Although not a possibility for this study, we would suggest that instructional treatment variables be broken out further to include characteristics of individual teachers and other school input characteristics by individual student. Data which would enable the investigator to match individual achievement with individual resources might provide insight into questions such as "Do teachers make a difference? Is nonschool learning intervention universal in its effects on the formal education process?"

Thanks are extended to Ron Lacis, a 2nd grade student at Mary Evelyn Castle Elementary School in Indianapolis, for his award-winning cover design.

Dr. Patrick Gavigan
Needs Assessment Coordinator

John Hesemann
Statistician

TABLE OF CONTENTS

Highlights of Assessment Data Reanalysis..... 1

Summary of Preliminary Investigations 9

Summary of Results With Student as the Unit of Analysis...11

Table I: Commonality Analysis With Student as the Unit of Analysis, Components Expressed as Percentages of R^2

Summary of Results With School as the Unit of Analysis... 13

Table II: Commonality Analysis With School as the Unit of Analysis, Components Expressed as Percentages of R^2

Attachment A: Variable Definitions..... 23

Attachment B: Selected References 29

HIGHLIGHTS OF ASSESSMENT DATA REANALYSIS

This material highlights the background, purposes, methods, procedures, and major results obtained by the reanalysis of the 1973 assessment data. A question and answer format is used to introduce major points.

What is the purpose of analyzing the correlates of reading achievement?

The intent of this study is to uncover those factors which appear to explain why some students read better than others. The major objectives of this study are to determine which aspects of the instructional process are most effective in increasing reading performance and which of those important characteristics which govern reading ability could be altered within the context of the educational community. By analyzing correlates of achievement, this study also serves future needs assessment efforts. Predictors of the genre developed by this investigation will facilitate a more reasoned process for identifying school reading programs most in need of modification.

How does this study differ from past reports?

The intent of the initial analysis of assessment data gathered in 1973 was to accurately describe the status of student attainment of a cross section of goals for public education in Indiana. Written for lay audiences, earlier reports sought only to picture existing levels of student performance. The present study is designed to explore the kinds of statistical relationships which may be inferred between a student's performance of selected reading tasks and (a)

the type of school he attends, (b) his socioethnic background, (c) his attitudes toward school and the future, and (d) indicators of the type of instructional programs employed in the student's school.

To treat these questions at other than a descriptive level required the application of associational models of data analysis not always familiar to needs assessment audiences. Unfortunately, the application of association analysis models to survey data is an issue in itself. As a result, methodology must be carefully discussed before reporting the results of these analyses.

This study differs from past treatments of this data in the manner in which the data was collected prior to analysis. Earlier reports dealt with the percentage of correct responses for each item. These percentages for all items contributing to an objective were averaged to reflect a score for each of four reading objectives. The same procedure was followed to report scores for major subpopulations--divided by region, community type and size, sex, race, and levels of parental education. This was done at each of three grade levels. On the other hand, exploration of the ways in which results differ from one student to another requires that data be collected across items to reflect scores for each individual student rather than an average score across items for an entire group. The criterion of performance (dependent variable) is then altered to reflect a single score for each student over a cluster of items rather than the percentage of responses on an item-by-item basis.

Why was reading singled out for this type of analysis?

Because of the magnitude of data gathered, as well as the technical tasks required to create an appropriate criterion (dependent variable) for analysis of correlates, effort had to be limited to one area of interest. Reading was selected for several reasons. Since reading is a high priority issue both within the state and the nation, the results of the study should be of interest to a broad spectrum of clients. It can also be argued that results pertaining to correlates of reading can be generalized to other areas of academic performance more readily than would be the case if the criterion were based upon another academic skill.

From a methodological point of view, reading offered the widest range of items from which to construct a criterion for analysis. The fact that many of the reading items have been utilized by the National Assessment of Educational Progress (NAEP) also prompted the focus on reading. For instance, the use of NAEP items diminished the need to establish the external validity of the data. In addition, the analysis of Indiana data based on NAEP items could enhance the transportability of these findings to a national audience. One sample of how these analyses could prove useful to national interests can be demonstrated by the following issue:

National Assessment has been promoting the notion that the correlates of achievement are substantially different when using

performance rather than general ability as the criterion for measurement.[1]

Where did the data come from?

Data presented in this report was gathered in the spring of 1973 at the request of the Division of Innovative and Exemplary Education (ESEA Title III) of the Indiana Department of Public Instruction. The study was conducted pursuant to Public Law 89-10, which calls on each state to establish priorities for innovative programs on the basis of assessed learner performance as a function of systematically established statewide goals.

The data represents the responses of more than 17,500 students. These students were included in a 6 per cent stratified, cluster sample of students who were enrolled at the 4th and 12th grade levels in the Indiana public schools. The sample was drawn in three stages. First, school corporations were partitioned by (1) four categories of region, (2) five categories of community type, and (3) two categories of size, yielding 40 cells--new classification categories. Next, corporations were selected at random from each cell until the total enrollment of corporations selected from a cell was approximately 6 per cent of the total enrollment of all corporations in the cell. In corporations with a small number of schools, all schools were represented in the sample. In corporations with a large number of schools, a subset of schools was chosen in

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[1] National Assessment of Educational Progress, "General Information Yearbook - A Description of National Assessment Methodology, With Special Attention Given to Reading and Literature" (Washington, D.C.: U.S. Government Printing Office, 1972). Edward C. Bryant, et al., Associations Between Educational Outcomes and Background Variables. (Rockville, Md.: Westat, Inc., 1974).

such a way that they presented the range of sizes found in the corporation. Finally, students were selected in each of the three grades (4, 8, and 12) by choosing every 16th name on lists of students, until the desired sample size was attained (excluding students absent or choosing not to participate).

Instrumentation for the reading portion of the study consisted primarily of items developed by NAEP. A paper-and-pencil, forced-choice format was used exclusively. Respondents were offered an "I do not know" alternative for each of the items and were given the option to select this alternative whenever they thought it to be most appropriate.

Students also responded to items concerning their judgments about school in general, as well as their reading habits in particular. Respondents provided data which indicated the educational level of their parents, sex, and racial heritage as well (see Attachment A).

In addition to information collected from students, data from state agency and 1970 Census records (Count IV) were used to construct additional independent variables concerning income

differences among school districts and instructional differences among schools.[2]

How was the data analyzed and interpreted?

As stated earlier, the thrust of this study was to identify variables which related to reading performance. The main statistical tool employed in this investigation was multiple correlation analysis. Also, factor analytic techniques were used to identify the structural properties of the data prior to establishing variables for analysis.

The variance in reading achievement accounted for by multiple correlations was also partitioned using a technique called commonality analysis.

Commonality analysis allows one to divide the total variance explained into distinct portions which are (1) unique to one particular variable or set of related variables, or (2) variations which only can be accounted for jointly across clusters of variables.

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[2] For more information concerning sample design and instrumentation, see Indiana Educational Needs Assessment Project: A Report of Data Gathered in 1973 (Indiana Department of Public Instruction, 1974). For readers who are interested in the methods and summary findings of NAEP Reading Assessments, see the following publications compiled by the National Assessment of Educational Progress: Reading: Summary Data (Washington: U.S. Printing Office, 1974), and Recipes, Wrappers, Reasoning and Rate: A Digest of the First Reading Assessment, (Washington, D. C.: U.S. Government Printing Office, 1974). Reading: Released Exercises (Washington, D.C.: U.S. Government Printing Office, 1973), is a must publication for those readers who are interested in NAEP results on an item-by-item basis. For an excellent overview of national assesssment goals and operations, see General Information Yearbook Washington, D.C.: U.S. Government Printing Office, 1974).

In this manner the effects of student background variables, variables based on judgment items, geographic and fiscal characteristics of school districts, and instructional characteristics of schools can be compared and contrasted as they related to each of the five dependent measures of reading achievement identified.[3]

Because of the exploratory nature of this study, no hypotheses are tested. To claim that the data supports hypotheses formed strictly on the basis of post hoc inspection is unwarranted. It seems appropriate, however, to observe whether or not this data is consistent with other major efforts to explain discrepancies in either school or student performance. In preparing the narrative sections of this report, an effort was made to compare these results

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[3] Cain and Watts in "Problems in Making Policy Inferences From the Coleman Report," American Sociological Review (1970), have faulted this technique for not treating variables which can be altered differently from those variables which cannot be affected by policy decisions. These statisticians claim that a "good" regression model is predicated upon sufficient theory so that magnitudes of predictable changes in the dependent variables can be ascertained. In his "Reply to Cain and Watts," American Sociological Review (1970), Coleman asserted that educational variables have not reached a level of reliability where arguments against current procedures for not being able to support ironclad predictions is appropriate. He also stated that a high degree of interdependency of variables included in his analysis would defeat attempts to use the size of regression coefficients to reflect direct relationship between corresponding predictors and the criterion. Also see Alexander Mood's introduction to A Study of the Attitude Toward Life of Our Nation's Students (Washington: U.S. Government Printing Office, 1973). These writers concur that the commonality analysis model will not allow for ironclad predictions. But these procedures do indicate ways in which variables interact in their influence on a criterion, and provide essential keys for further treatment through experimental studies.

with conclusions and implications drawn from previous studies.[4]

What are the major findings?

Summary results are discussed in terms of two units of analysis, the student and the school. In both cases, predictors of variance have been determined by multiple linear regression and partition of multiple correlation.[5] In addition, some preliminary investigations using partial correlation analysis and analysis of variance within select subgroups of the population are highlighted.

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[4] See James Coleman, et al., Equality of Educational Opportunity (National Center for Educational Statistics, 1966), and George Mayeske, et al., A Study of Our Nation's Schools, and A Study of the Achievement of Our Nation's Students (Washington, D.C.: U.S. Office of Education, HEW, 1970 and 1973, respectively). Many educators would benefit from a closer inspection of Christopher Jenks, Inequality--A Reassessment of the Effect of Family and Schooling in America. (New York: Basic Books, 1972). Pivotal studies which utilized other than the "Coleman data base" are listed in Attachment B.

[5] These two units of observation have a tradition of serving different audiences. Analyses of differences in students have been of interest to persons involved with the instructional process in which analysis of differences between schools have been scrutinized by policy makers at all levels of educational governance.

The researchers used both units of analysis in treating this data in order to make a more reasoned comparison between these findings and more publicized reports of associations between school programs and student performance. The apparent lack of influence of instructional variables as reported separately by Coleman and Jenks was predicated upon the school, rather than the student, as the primary unit of observation. Other analyses--even of the Coleman data base--using the student as the primary unit of analysis tend to support the notion that a quality instructional program can influence a student's performance directly.

SUMMARY OF PRELIMINARY INVESTIGATIONS

Before examining the main points, some preliminary findings are offered. Partial correlation analysis gave preliminary indications of the independence of the effects of key variables. The only variables which showed significant interdependence in predicting reading ability were race, geographic region, and community type. This was not unexpected, since the racial mix of Indiana schools varies considerably over locale.

A brief look at differences within select subpopulations also suggests that race, sex, and certain attitudes may interact in predicting reading ability only within heritage groups according to the sex of the individual. When scores are broken out by subcategories of race, sex, parental education, and positive attitude toward formal educational process, the independent effect attributed to race is diminished.

Items in the reading instrument were selected originally to reflect one of our specific objectives. Prior to these analyses, factor analytic techniques were employed to check whether or not items would cluster accordingly; only one strong factor appeared, however. More importantly, neither the one factor nor residual components could be defined by the criteria specified (subthemes)

in any of the four objectives.[6]

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[6] A similar application of factor analysis has been performed on data collected by standardized reading tests. Each of the three tests included in the study claimed to differentiate between respondents on the basis of three to five of the expected outcomes of the reading process. A possibility of 11 separate factors existed prior to analysis; yet, only one factor emerged with an eigenvalue greater than 1. See John Oswald, William Lawlor, et al., "A Factor Analysis of Reading Skills at Grades 6, 9 and 12, Using Variables From Three Standardized Reading Tests" (a paper presented at the American Psychological Association Convention: New Orleans, 1974).

SUMMARY OF RESULTS WITH STUDENT AS THE UNIT OF ANALYSIS

The 77 variables used as predictors fall into four clusters: student background variables (race, parental education, and sex); geographic variables (region, type of community, family income within district); variables of student attitudes (judgments about reading, school, self, etc.); and instructional variables (varying patterns of school organization, staffing or existence of nontraditional curriculum).

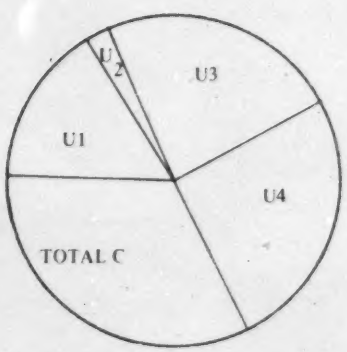
In accounting for varying reading scores among students, the four clusters show a relatively high degree of independence from one another. This can be illustrated by the small ratio of common to unique portions of explained variance. It is noteworthy that the degree of independence increases as the students progress by grade level.

In terms of the relative strength of the four clusters over grade levels, the associations appear to be remarkably stable. As expected, student judgment and student background clusters reach maximum association with reading at the 8th-grade level.

Among the four clusters, only that cluster which deals with geographic location and average family income shows a negligible effect. These variables reach maximum association with reading at the senior level. The instructional and judgmental clusters maintain a strong and equally unique effect across the three grades. It is more difficult to separate the unique influence of student judgment variables from the unique influence of student background variables than is the case with instructional variables in combination with other clusters.

TABLE I. COMMONALITY ANALYSIS WITH STUDENT AS THE UNIT OF ANALYSIS, COMPONENTS EXPRESSED AS PERCENTAGES OF R^2.

	GRADE 4	GRADE 8	GRADE 12
R^2	.29749	.25918	.19148
N	907	1727	2161
Unique Components			
U1 (background variables)	16.0	23.0	20.1
U2 (geographic variables)	2.1	2.7	8.1
U3 (judgmental variables)	24.2	30.0	26.5
U4 (instructional variables)	25.0	17.8	24.2
Common Components			
C12	3.3	4.9	3.6
C13	8.5	10.4	6.8
C14	6.4	3.0	3.2
C23	0.9	0.2	1.2
C24	1.7	2.2	- 4.5
C34	2.8	0.8	1.8
C123	1.9	0.1	0.9
C124	0.0	2.4	5.8
C134	5.1	1.4	0.7
C234	1.5	0.8	- 0.7
C1234	0.7	1.7	2.3
TOTAL U	67.3	73.5	78.9
TOTAL C	32.7	26.5	21.1



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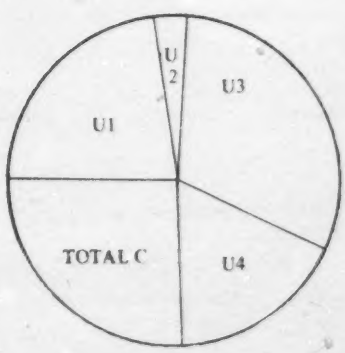

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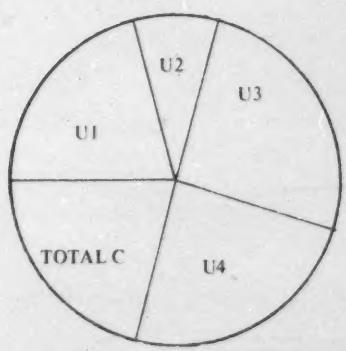


GRADE 12

SUMMARY OF RESULTS WITH SCHOOL AS THE UNIT OF ANALYSIS

Again, commonality analysis was used to compare effects of the four clusters described previously. However, variables which previously described individual students (race and parental education and judgment variables) were averaged over the school as was the dependent variable (reading scores).

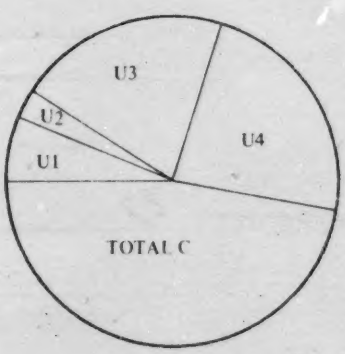
The similarity of results obtained with the school, rather than the student, as the focus of investigation was not expected. Most significantly, the cluster of instructional variables maintain the strongest influence on reading levels and this effect increases over grade levels. On the other hand, the socioethnic characteristics of a school's student body--e.g., racial mix, mean parental education--appear to exert far less influence on reading scores than was thought would be the case.

As was the case when the student was the unit of analysis, the longer a student remains in school the more easily one can explain schoolwide reading skills on the basis of disjointed variables. The total per cent of explained variation which is unique to one of the four clusters of variables increases over grade levels. For example, it is difficult to separate the unique influence of students' attitudes from students' background characteristics at the 4th-grade level. By the senior year, these two clusters of variables do not share common variance in predicting differences in reading levels between schools. In addition, background characteristics of a school's student body, as well as more precisely identified school variables such as its location, size, average family income, etc., reach maximum association with

schoolwide reading performance at the 8th-grade level. By the senior year, that portion of unique variance attributed to race and/or geographic characteristics diminishes greatly.

TABLE II. COMMONALITY ANALYSIS WITH SCHOOL AS THE UNIT OF ANALYSIS, COMPONENTS EXPRESSED AS PERCENTAGES OF R^2.

	GRADE 4	GRADE 8	GRADE 12
R^2	.62097	.75438	.80311
N	233	157	111
Unique Components			
U1 (background variables)	6.8	17.3	7.0
U2 (geographic variables)	2.1	12.8	8.3
U3 (judgmental variables)	21.4	10.0	23.0
U4 (instructional variables)	22.8	27.9	33.6
Common Components			
C12	- 1.3	4.6	1.3
C13	11.5	0.8	- 2.8
C14	2.8	1.2	- 0.5
C23	2.1	2.6	9.2
C24	0.6	1.2	- 2.6
C34	11.1	- 1.5	7.6
C123	1.2	8.8	5.9
C124	0.6	1.9	2.4
C134	7.8	4.9	7.6
C234	2.7	1.3	- 8.7
C1234	8.0	6.2	8.7
TOTAL U	53.0	68.0	71.6
TOTAL C	47.0	32.0	28.4



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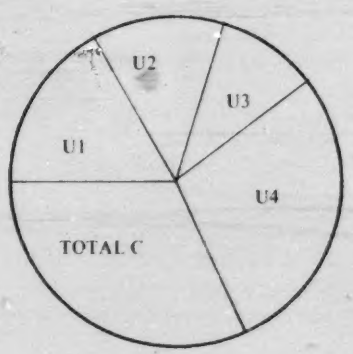

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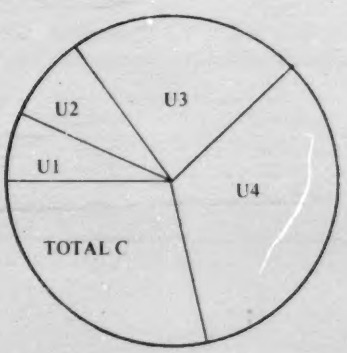

GRADE 12

What do these findings mean?

The most striking implication is that school programs do make a difference. Variables indicating the existence of select programs and instructional practices proved to be substantial predictors of reading abilities for between-school comparisons as well as comparisons between individual students. This data also suggests that schools might reduce disproportionate levels of reading achievement between students of different ethnic background through differential alteration of instructional programming.

Although school variables such as an ungraded program, differentiated staffing, etc., can be linked to higher levels of student reading ability, it does not mean that improvement in student performance can be readily attained. These variables might be indicators of a needed change in even more basic structures of school management. In any case, effective conversion to programs which encompass these concepts would require a rethinking on the part of teachers and administrators of both their philosophy of education and methods of instruction.

The problem of successful alteration of instructional practices is further compounded by another major finding of this study. Other significant indicators of performance, such as students' background and attitudes, appear to be highly independent of program-oriented variables. Consequently, a sustaining and total effort to alter the significant correlates of reading must be multifaceted, recognizing the possibility that separate treatments may be needed when

modification of affective as well as cognitive behaviors are to be held as expected outcomes of the instructional process.

These implications are not "cast in concrete." They should be regarded as hypotheses which call for further experimentation before one concludes that altering predictors will actually alter reading achievement. Firmer conclusions may be drawn when one assesses the impact this research has on the need to re-interpret results from similar investigations. Examples of how these findings are important in this vein are described in the following paragraphs.

Most major studies investigating associations between schools and student outcomes (a) use the school rather than the student as the primary unit of observation, and (b) use a general measure of ability as criterion rather than a specific performance measure. In regard to point (a), this study employed both units of analysis. An inspection of Chart I as compared to Chart II will show that the four clusters of variables maintain the same relative proportions even when averaged within schools. Thus, the apparent contribution of instructional variable found in this investigation, but not in many others, cannot be explained simply as a result of

different units of analysis.[7] In terms of point (b), it has been noted that the National Assessment of Educational Progress claims that associations of student performance will vary significantly whenever specific performance indicators, instead of general ability, form the criteria for measurement. Since this study used NAEP measures, it is not surprising that these results tend to support their assumption. More specifically, this data showed a higher degree of independence among predictor variables than has been the case in similar investigations. For example, many researchers have concluded that it is impossible to distinguish between where background factors end and where school factors begin in their relative influence on student performance. Since similar data analysis procedures, as well as compatible criteria for selection of predictors, were employed in this study, it would appear that the criterion selected has the most direct influence on the degree of expected intercorrelation among predictors.

The major implication of these results, in contrast to some well-known studies, is that this data may be used to justify expenditure of resources for instructional improvement. On the

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[7] Although student variables may be averaged to provide school variables, there is no reason to expect variables collapsed in this manner to retain the same statistical relationships with each other. For example, if sex is a strong predictor in student analyses, then one might expect that it would disappear as a predictor of differences between schools, since students are distributed evenly on the basis of sex in most public schools. Because many individual differences tend to "even out" when explaining variation between schools, one might expect that the variables that do differentiate between schools account for a higher proportion of variance (R^2) when the school, rather than the student, is the unit of analysis.

basis of similar investigations, many have concluded that quality "schooling" has little to do with the school itself. An unfortunate outgrowth of this line of thinking has been a maintenance of the status quo in the classroom so that educational resources could be directed toward implementing broader-range social policy. This study suggests that quality instruction might be the more effective key to unlock the mystery of improved educational outcomes.

There are impressions that come through this data, hard and soft, in a variety of ways and which coincide with implications drawn in the past. Before concluding that the data runs counter to all investigations of recent vintage, some salient points of convergence are offered:

-Broad indicators of attitude toward life account for a greater variation in reading ability than do indicators of attitude toward the specific task at hand.

-Background factors appear to be differentially important for various minority groups, as well as dependent on the sex of the student(s) in question.

-Deviations from expected scores for students with both parents educated beyond high school suggest that working mothers may have a less than positive impact on the child's reading performance quite aside from the impact of greater family income.

-Racial heritage appears to account for slightly less than 10 per cent of variation in scores after taking into account the influence of parental education and individual student characteristics.

An implication for reading and measurement specialists might be drawn from preliminary analysis of instrumentation. Although items were chosen as representatives of various levels in a hierarchy of mental skills, factor analysis did not cluster items accordingly. This result suggests that more concrete characteristics

of the reading process, such as content or sentence structure, etc., may distinguish needed skills better than hierarchies of mental skills most often used to describe the expected outcomes of reading programs.

Would a review of the entire report be beneficial?

Readers who are more interested in "how" this data was generated than in what this data might mean from a practical point of view must review the entire text. For example, Chapter Two discusses the construction and scaling of predictor and dependent variables, the proportion of variance explained by predictor variables such as a function of sample size, and the possible effects of unexplained factors such as the students' innate abilities and differential dropout rates between ethnic groups.

Individuals who are responsible for the design of large-scale instructional improvements may want to read the entire report to find out what instructional variables predicted best and how they interacted with other clusters of variables. Subsequent chapters will be more introspective and technical in nature, however. A firm grasp of the issues brought forth by these introductory remarks is needed if further analysis is to be of value.

Those individuals responsible for large-scale needs assessment projects also could benefit from greater knowledge of this study. A related issue to which this study speaks is the question of whether or not inferential research is a productive step in the needs assessment process. While some persons within the education community do see assessment as logically encompassing experimental

models of data analysis, others tend to view the assessment process more as vehicle toward public accountability than as a tool for behavioral research. The resulting debate has been a heated one with practical and theoretical implications on both sides of the argument.

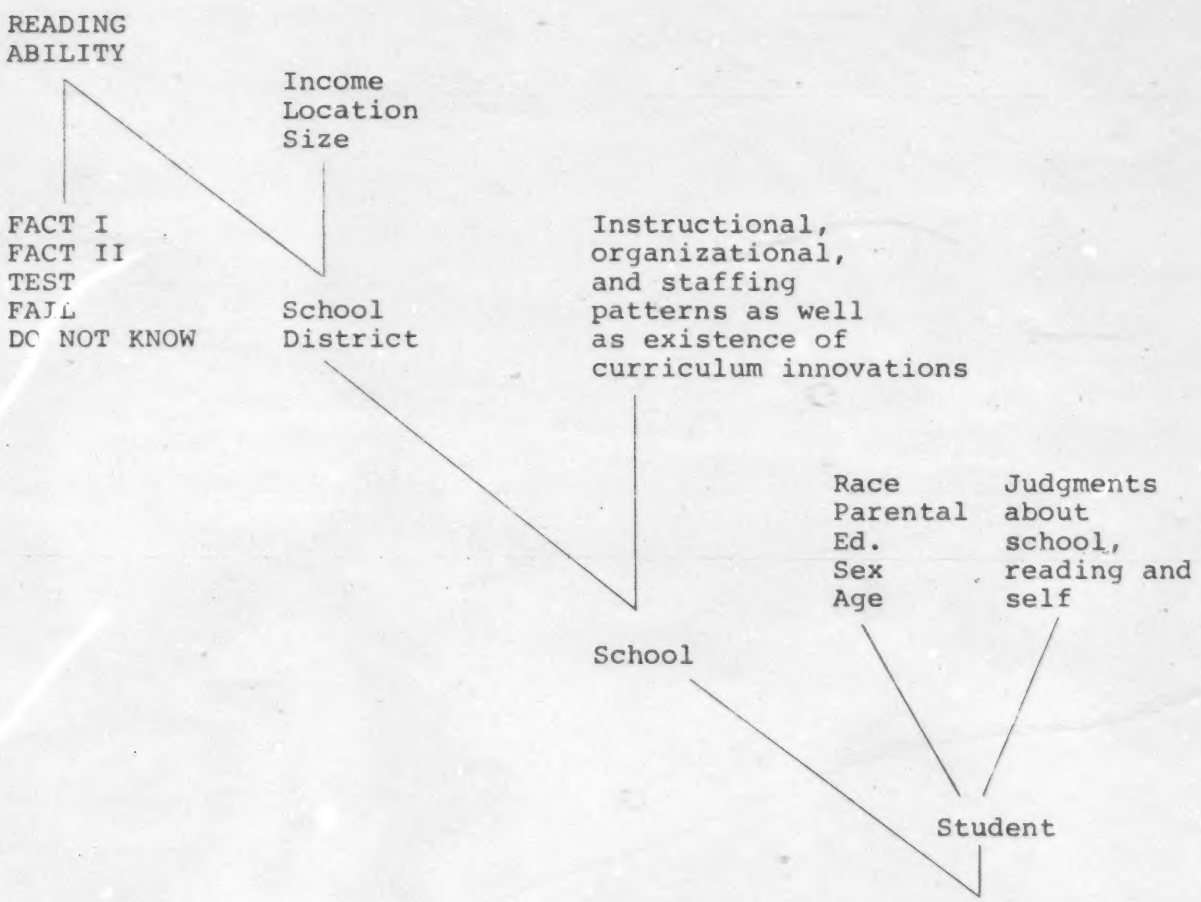
A review of the entire report should illustrate the great amount of time which must be expended in selecting a sample, collecting data, defining variables, selecting appropriate statistical techniques, computerizing the data and statistics, and interpreting the results. Unless integrated data bases are readily accessible to reduce the nuts and bolts constraints of data collection as well as statistical analysis, state assessment personnel should be content with describing those things which appear to take place in our schools.

In terms of theoretical limitations, all readers should be cautioned that the application of associational models to data collected by survey methods is a tenuous procedure. More experimental studies will always be needed to test the causal links suggested by studies such as this one. On the other hand, associations uncovered by this investigation are not likely to be spurious since the sample was quite large and carefully stratified. The breadth of predictor variables considered allows for a variety of indepth investigations using the same body of data and subsequent hypothesis testing on comparable samples.

ATTACHMENT A

Variable Definition

Variables selected for this investigation fall into five groups: One group consists of five dependent measures of reading ability in addition to four different sets of independent variables which reflect (1) background characteristics of students, (2) student attitudes toward school and reading, (3) geographic characteristics of the school district, and (4) characteristics of a school's instructional programs.



Dependent Variables. Five separate dependent variables were defined from test items developed by National Assessment and administered in Indiana by the State Education Agency. Two variables, FACT I and FACT II, are each the number of items answered correctly from corresponding sets of items chosen on the basis of factor analysis.

The frequency distribution of both FACT I and FACT II are skewed: FACT I high scores, and FACT II low scores. Since skewedness can limit sensitivity, a third independent variable, TEST, was constructed. TEST is the number correct answers in a set of 10 items of moderate difficulty, and those which discriminate best of the 78 items which comprise the original instrument.

A fourth dependent variable, FAIL, is a dichotomous pass-fail measure with fail being defined as a score of less than 15. The fifth dependent variable, DON'T KNOW, is the number of times a respondent selected the "I do not know" option in answering each of 78 items.

Background Variables

a) HER (heritage), dichotomous: (1) black; (0) other. Respondents who checked either the Spanish surname, Oriental or American Indian categories were small in number and not included in summary analyses.

b) ED (parental education), continuous: (1) neither parent attended high school; (2) one parent attended high school; (3) both attended high school; (4) one parent educated beyond high school; (5) both parents educated beyond high school

c) Sex: (1) male; (0) female.

d) AD (Age deviation from mean for grade level) (1) one standard deviation (SD) younger; (2) less than one SD; (3) one SD older.

Attitudinal Variables

a) AV021 (interest in reading) dichotomous: (1) dislike reading; (2) other. This variable was constructed from an item asking what the student thought about reading in school. One response is "I do not like to read." Other response alternatives indicate a more positive attitude toward reading, hence they were lumped together in forming a dichotomous variable.

b) AV022 (enjoyment of reading) continuous: (1) a waste of time; (2) boring; (3) enjoyable, but a chore; (4) enjoyable; (5) very enjoyable.

Tests of linearity reflected significant deviations from linearity and regressions on AV022 and its square provided the following transformations:

DV3TEST TO22=(2.16-0.30 AV022) AV022

c) AV024 (frequency of library usage) continuous: (1) don't use; (2) 6 months ago; (3) 1 month ago; (4) this past week.

Test of linearity supported the following transformation:

DV3TEST TO24=(1.68-0.02 AV024) AV024

d) AV020 (like school) continuous: (1) I like it very much; (2) I like it; (3) neither like nor dislike; (4) many days I would like to stay away; (5) if I could, I would quit school.

e) AV056 ("people like me do not have any say about what the school does") dichotomous: (0) agree or not sure; (1) disagree or strongly disagree.

f) AV055 (classroom rules) dichotomous: (1) rules judged to be too strict or not strict enough; (0) rules about right.

g) AV056 (lack of classroom rules) dichotomous: (1) we have no rules; (2) other.

h) AV086 (preferred kind of teacher) dichotomous: (1) one who sticks up for you; (0) other.

This variable as well as the next four variables were constructed by dichotomizing a categorical item.

i) AV087, dichotomous: (1) one who understands you; (0) other.

j) AV088, dichotomous: (1) one who makes you work; (0) other.

k) AV089, dichotomous: (1) one who gives you lots of help; (0) other.

l) AV090, dichotomous: (1) one who inspires you; (0) other.

m) AV123 (availability of books in library) continuous: (1) never find materials I need; (2) seldom find materials I need; (3) usually find materials; (4) always find materials I need.

n) AV124 (demands of society) dichotomous: (1) will not or probably be unable to live up to demands of society; (2) will live up to or probably will live up to demands of society.

o) AV134 (perception of physical self) dichotomous: (1) do not like my body or wish I could change my body; (2) have no feelings one way or another, or are satisfied with body.

p) AV136 (when beginning a new task) dichotomous: (1) I won't be successful; (2) I do well.

q) AV177 (self in future) continuous: (1) almost sure I do not have a chance to succeed; (2) sometimes question if I will succeed; (3) am sure things will turn out well for me.

Geographical Variables

a) GVOINCOME (mean family income in school corporation) continuous. This variable was thought to serve more as a physical descriptor of communities since family income was not available on a per student basis.

Regional Variables

Regional variables were constructed by creating a set of dummy variables from a categorical item with four options: North, Northwest, Indianapolis and South.

		North	Northwest	Indianapolis	South
b)	GVR1	1	0	0	0
c)	GVR2	0	1	0	0
d)	GVR3	0	0	1	0

System Variables

System variables were generated by constructing a set of dummy variables from a categorical item with five options describing community type: urban, suburban, large town, small city and rural.

		Urban	Rural	Large Town	Small City	Suburban
e)	GVS1	1	0	0	0	0
f)	GVS2	0	1	0	0	0
g)	GVS3	0	0	1	0	0
h)	GVS4	0	0	0	1	0

i) GVOSize (relative size for region and community type) dichotomous: (1) large; (2) small.

School Variables

Fourteen school variables were identified for analysis. They were derived through a principal component analysis of 52 separate descriptors of school organizational patterns, instructional patterns, staffing patterns, peripheral curriculum innovations or the existence of innovative program in mainline curriculum areas. Factor scores were computed for each factor to define variables for regression analysis.

a) IV01
Computer Assist Instruction,
Continuing Ed Program,
Honors Program....

b) IV02
Innovative Music,
Innovative Art,
Innovative Physical Ed....

c) IV03
Parent Volunteers,
Peer Tutors,
Cadet Teachers....

d) IV04
Innovative Home Economics
Innovative Industrial Arts....

e) IV05 **
Ungraded Primary,
Ungraded Intermediate....

f) IV06
Lg-group, Sm-group Instruction
Independent Study,
Teacher Aides....

g) IV07 *
Business Ed.,
Driver Ed....

h) IV08
Individual Program
Instruction,
Programmed Reading,
Compensatory Ed. program....

i) IV09
Innovative Math,
Innovative Social Studies
Innovative Language Arts
Innovative Science....

j) IV010 *
Voc-Tech Ed program....

k) AV011
Ungraded high school,
Ungraded middle school....

l) IV012
Reading lab,
Differentiated staff,
Flexible schedule....

m) AV013
Innovative Foreign
Language Arts,
Foreign Language....

n) AV014
Drug Program....

* High school only

** Elementary school only

ATTACHMENT B

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